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| EXAMINER | |
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| SYKES, ALTREV C | |
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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/593,902 | TAKEUCHI ET AL. | |
| | Examiner | Art Unit | |
| | ALTREV C. SYKES | 1794 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-23* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-23* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *20060922*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

## DETAILED ACTION

### *Claim Rejections - 35 USC § 102*

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1, 4, 7, 10, 13, 14 and 17 are rejected under 35 U.S.C. 102(b) as being anticipated by Olry et al. (US 6,051,313).

Regarding claims 1 and 14, Olry et al. discloses a yarn is formed from discontinuous parallel fibers which are not twisted and which are held together by a covering yarn of sacrificial material wound around the fibers. (See Abstract) Olry et al. discloses the hybrid yarn can be formed from carbon fibers and optionally from ceramic fibers or with carbon precursor fibers and optionally with ceramic precursor fibers. In the latter case, the fibers can be those obtained by spinning the initial precursor or it can be in a state intermediate between the initial state and the carbon or ceramic state. Such an intermediate state may be a pre-oxidized state or a semi-carbonized state or a semi-ceramic state. (See Col 6, lines 30-38)

Absent a showing to the contrary, it is the examiner's position that the article of the applied prior art is identical to or only slightly different than the claimed article. Even though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-

process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process. *In re Thorpe*, 227 USPQ 964, 966 (Fed. Cir. 1985). The burden has been shifted to the applicant to show unobvious difference between the claimed product and the prior art product. *In re Marosi*, 218 USPQ 289 (Fed. Cir. 1983). The applied prior art either anticipated or strongly suggested the claimed subject matter. It is noted that if the applicant intends to rely on Examples in the specification or in a submitted declaration to show non-obviousness, the applicant should clearly state how the Examples of the present invention are commensurate in scope with the claims and how the Comparative Examples are commensurate in scope with the applied prior art. In the instant case, Olry et al. ('313) further discloses the fibers comprise an intimate mixture of fibers of at least two different natures selected from carbon fibers or pre-oxidized polyacrylonitrile based carbon precursor fibers, or anisotropic or isotropic pitch based carbon precursor fibers, or phenolic or cellulosic based carbon precursor fibers, and ceramic fibers or ceramic precursor fibers. Olry et al. also discloses a method for making said yarn. (See Abstract) Olry discloses a method comprising steps consisting of providing ensembles of continuous filaments, each ensemble being constituted by filaments of the same nature selected from a polyacrylonitrile based carbon or carbon precursor, or an isotropic pitch based carbon or carbon precursor; controlled stretching and cracking of each fiber ensemble to obtain discontinuous fibers which are parallel to each other; intimately mixing the fibers of at least two ensembles of cracked fibers which are different from each other, to obtain a hybrid yarn in which the mixed discontinuous fibers are parallel to

each other and not twisted; and winding the mixed discontinuous fibers with a covering yarn of sacrificial material to ensure the integrity of the hybrid yarn obtained. (See Col 4, lines 13-41) Cohesion of the ensemble of fibers constituting sliver 14 is ensured by covering using a covering yarn 16 of sacrificial material. (See Col 5, lines 47-49) The term "sacrificial material" which constitutes the covering yarn here means any material which can be eliminated without leaving a residue on the hybrid yarn and without spoiling the fibers of the yarn. As an example, the sacrificial material could be a soluble polymer such as a polyvinyl alcohol (PVA). (See Col 5, lines 51-60) Covering endows the hybrid yarn with the behavior required to undergo textile operations, in particular weaving. Covering is carried out using a known machine, for example the "Parafil" machine from the German company Spindelfabrike Suessen. (See Col 5, lines 60-63) Therefore, examiner notes that an isotropic pitch-based carbon fiber spun yarn fabric is provided for by the method as disclosed by Olry et al. ('313)

Regarding claims 2 and 15 applicant discloses that it is *preferable* that the composite yarn further include a sizing agent formed on the surface of the spun yarn which will be dissolved and removed from the spun yarn fabric. (See pg. 6, lines 2-7 *emphasis added*) As such, examiner notes that because the sizing agent is to be ultimately removed, using a sizing agent would not change the final structure of the fabric there being no suggestion in the instant specification to the contrary. Additionally, as set forth above, Olry discloses a substantially similar final fabric product as that claimed by applicant. Examiner therefore has reason to believe that the fabric as disclosed by Olry et al. meets the limitations as claimed by applicant.

Regarding claims 4, 10, and 17 Olry et al. discloses the sacrificial material could be polyvinyl alcohol (PVA). (See Col 5, lines 51-60) Applicant discloses that the *preferred* water-soluble polymer fiber is a water-soluble vinylon fiber. (See pg. 8 lines 11-13, *emphasis added*) As such, examiner notes that because the water-soluble polymer fiber is to be removed, the exact nature of the fiber (i.e. vinylon) would not change the final structure of the fabric and any water-soluble polymer fiber would be sufficient there being no suggestion in the instant specification to the contrary. (See pg. 5, lines 1-6) Examiner therefore has reason to believe that the polyvinyl alcohol covering yarn as disclosed by Olry et al. meets the limitations as claimed by applicant.

Regarding claims 7 and 13 Olry et al. ('313) further discloses the fibers comprise an intimate mixture of fibers of at least two different natures selected from carbon fibers or pre-oxidized polyacrylonitrile based carbon precursor fibers, or anisotropic or isotropic pitch based carbon precursor fibers, or phenolic or cellulosic based carbon precursor fibers, and ceramic fibers or ceramic precursor fibers. Olry et al. also discloses a method for making said yarn. (See Abstract) Olry discloses a method comprising steps consisting of providing ensembles of continuous filaments, each ensemble being constituted by filaments of the same nature selected from a polyacrylonitrile based carbon or carbon precursor, or an isotropic pitch based carbon or carbon precursor; controlled stretching and cracking of each fiber ensemble to obtain discontinuous fibers which are parallel to each other; intimately mixing the fibers of at least two ensembles of cracked fibers which are different from each other, to obtain a hybrid yarn in which the mixed discontinuous fibers are parallel to each other and not twisted; and winding the mixed discontinuous

fibers with a covering yarn of sacrificial material to ensure the integrity of the hybrid yarn obtained. (See Col 4, lines 13-41) Cohesion of the ensemble of fibers constituting sliver 14 is ensured by covering using a covering yarn 16 of sacrificial material. (See Col 5, lines 47-49) The term "sacrificial material" which constitutes the covering yarn here means any material which can be eliminated without leaving a residue on the hybrid yarn and without spoiling the fibers of the yarn. As an example, the sacrificial material could be a soluble polymer such as a polyvinyl alcohol (PVA). (See Col 5, lines 51-60) When a PVA yarn is used, elimination is by washing in a water bath, draining and drying. (See Col 6, lines 5-6) Covering endows the hybrid yarn with the behavior required to undergo textile operations, in particular weaving. Covering is carried out using a known machine, for example the "Parafil" machine from the German company Spindelfabrike Suessen. (See Col 5, lines 60-63) Therefore, examiner notes that an isotropic pitch-based carbon fiber spun yarn fabric is provided for by the method as disclosed by Olry et al. ('313)

***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

5. Claims 2, 5,6, 8, 11,12,15,18-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Olry et al. (US 6,051,313) in view of Kitamura et al. (US 5,030,435) and Hattori et al. (US 4,552,329)

Regarding claims 2, 8 and 15, Olry et al. ('313) discloses all of the claim limitations as set forth above, but the reference does not specifically discloses that the composite yarn further comprises a sizing agent layer which is also dissolved and removed with the water-soluble polymer fiber.

Kitamura et al. discloses pitch carbon fiber chopped strand accumulation has a high bulk density and relieve exothermic excursion naturally, and therefore neither combustion nor sticking takes place even in an oxidative atmosphere. (See Abstract) Kitamura et al. discloses an appropriate sizing agent, for example, a low-boiling solvent such as water and methanol or a sizing agent containing a solid lubricant such as molybdenum disulfide, tungsten disulfide, talc or graphite, is coated to pitch fiber just after the melt spinning process, bundling the fibers with a bundling roller, and then immediately cutting the bundle with a cutting apparatus into a length of 1 to 50 mm, preferably 1 to 25 mm, to obtain a chopped strand. (See Col 2, lines 46-55) The chopped strand of high density accumulation thus obtained is subsequently infusibilized and carbonized. (See Col 2, lines 64-66) Kitamura et al. discloses that the pitch fiber bundle may be isotropic. (See Col 3, lines 9-10)

Hattori et al. discloses carbon fibers made from polyacrylonitrile and pitches comprising a sizing agent. (See Col 4, lines 20-21) Hattori et al. further discloses one such method of separating bundles of carbon fibers into single fibers is a method in which sizing agent applied onto the surfaces of a single fiber for the purpose of facilitating handling of the fibers, is removed, followed by dispersing them in water with supersonic agitation. (See Col 5, lines 1-5) Hattori et al. discloses an alternative method of separating bundles of carbon fibers into single fibers is a method of using the carbon fibers treated with a water-soluble sizing agent. (See Col 5, lines 35-37)

As Olry et al. ('313), Kitamura et al., and Hattori et al. are all directed to pitch carbon fiber bundles, the art is analogous. Therefore it would have been obvious to one of ordinary skill in the art the time of the invention motivated by expected success to utilize the sizing agent as taught by Kitamura et al. and specifically, the water-soluble sizing agent of Hattori et al. in the fiber bundle as disclosed by Olry for the added benefit of facilitate handling of the fibers. (See Hattori et al. Col 5, lines 1-5)

Regarding claims 5, 6, 11, 12, 18, 19, 20-23 Olry et al. ('313) discloses the high modulus carbon fibers present in the hybrid yarn have a diameter of more than 8 μm, preferably more than 10 μm. Lower stiffness of the fiber preform and the composite material part in a direction perpendicular to the plies is thus guaranteed. (See Col 4, lines 1-5) Kitamura et al. discloses that the fibers may be cut to a length of 1 to 50mm, preferably 1 to 25mm. (See Col 2, lines 53-55) Kitamura et al. also discloses it is difficult to cut the bundle into a length shorter than 1 mm, and such a fiber length is too short to embody the desired reinforcing effect. When the length of the chopped strand is longer

than 50 mm, the chopped strand is the same to a continuous fiber so that an increase in fiber length gives no increase in reinforcing effect. When the length of the chopped strand is more than 50 mm, the high density accumulation state cannot be attained, and infusibilization is thereby hindered. (See Col 2, lines 56-64) It would have been obvious to one of ordinary skill in the art at the time of invention to have selected the overlapping portion of the ranges disclosed by the reference because overlapping ranges have been held to be a prima facie case of obviousness. *In re Malagari,* 182 USPQ 549. Further, modified Olry et al. ('313) fails to teach the isotropic spun yarn contains fine carbon fiber aggregates having a maximum diameter equal to or below 3.0 times an average diameter of foundation yarn of the spun or an abundance ratio equal to or below 3 pieces per 10m . It would have been obvious to one of ordinary skill in the art at the time the invention was made to optimize the diameter and abundance ratio since it has been held that, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation. *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). The burden is upon the Applicant to demonstrate that the claimed diameter and abundance ratio are critical and has unexpected results. In the present invention, one would have been motivated to optimize the diameter and abundance ratio motivated by the desire to control the stiffness of the final fiber fabric Olry et al. ('313) discloses a preference for low modulus carbon fibers having a specific diameter. Olry et al. ('313) also discloses the numbers of filaments of the different tows or slivers are selected, depending on their diameters, to obtain the

mixture of fibers in the desired proportions by weight in the hybrid yarn. (See Col 5, lines 5-9)

6. Claims 3, 9, and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Olry et al. (US 6,051,313) in view of Bompard et al. (US 6,585,842)

Regarding claims 3, 9, and 16 Olry et al. ('313) disclose the yarn is useful for fabricating fiber preforms for composite material parts. (See Col 1, lines 5-7) A fiber preform for a composite material part is produced by forming a two-dimensional fiber fabric at least partially from a hybrid yarn, by superposing plies formed by the fiber fabric and, after eliminating the covering yarn, by needling the superposed plies. (See Col 3, lines 5-9) Olry et al. ('313) discloses all of the claim limitations as set forth above, but the referenced doesn't specifically discloses that the water-soluble polymer fiber comprises a first water-soluble polymer fiber would in a first direction and a second water-soluble polymer fiber wound in a second direction.

Bompard et al. discloses a plurality of unidirectional sheets composed of two of various kinds depending on the use intended for the sheet. (See Abstract and Col 8, lines 15-16) Bompard et al. further discloses the tows may be of carbon fibers or ceramic fibers, or of fibers that are precursors of carbon or ceramic, glass fibers, aramid fibers, or a mixture of different kinds of fiber. (See Col 8, lines 16-19) The tows can be made of continuous filaments or of discontinuous filaments, and if they are discontinuous they can be obtained, for example, by bursting tows of continuous filaments. With tows made of discontinuous filaments, it is possible to use hybrid tows comprising filaments of different materials that are intimately mixed together. (See Col 8, lines 21-27) The strip

20a is placed adjacent to other strips 20b, 20c, 20d, and 20e that are identical or similar on a roll 25 that is free to rotate, thereby forming a unidirectional sheet 30. The strips can thus come from tows that are identical or different, e.g. if different, from tows of different weights, or made of fibers of different kinds, thereby making it possible to obtain a hybrid sheet. (See Col 8, lines 64-67) Various polymers can be used. Advantageously, the polymers used can be suitable for being sacrificed, i.e. they should be easy to eliminate, e.g. by being dissolved or by applying heat treatment. Amongst such polymers, mention can be made of polyvinyl alcohol (PVA) or polyvinylpyrrolydone type polymers that are soluble in water, and of soluble polyester. (See Col 9, lines 28-34) The resulting multiaxial sheets can be used for making the reinforcement of composite material parts, e.g. by well-known techniques of draping or needling superposed plies. (See Col 18, lines 17-19)

As Olry et al. ('313) and Bompard et al. are both directed to fibers for use in composite material parts, the art is analogous. Examiner notes that Bompard et al. teaches two different water-soluble polymers to be used with the carbon fibers. Therefore, since Olry et al. ('313) discloses the use of a water-soluble fiber from a polyvinyl alcohol polymer also recognized by the teaching of Bompard et al., it would have been obvious to one of ordinary skill at the time of the invention to utilize polymer fibers made from both types of polymers instead of just one in order to provide a completely expected result of a polymer fiber that would be dissolved from the composite yarn fabric. Absent unexpected results, examiner also notes that since both fiber types surrounding the isotropic pitch-based carbon fiber spun yarn are to be dissolved and

removed, it would not matter which direction the fibers were wound as their function would be completely temporary for achieving the final product.

7. Claims 1, 2, 4, 7, 10, 13, 14, 15 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Olry et al. (US 5,228,175) in view of Chiu et al. (US 6,800,364).

Regarding claims 1, 7, 13 and 14 Olry et al. ('175) discloses preforms formed of refractory fibers for producing composite material articles. The invention also relates to a composite yarn suitable for the manufacture of such preforms. (See Col 1, lines 8-12) Absent a showing to the contrary, it is the examiner's position that the article of the applied prior art is only slightly different than the claimed article. Even though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process. *In re Thorpe*, 227 USPQ 964, 966 (Fed. Cir. 1985). The burden has been shifted to the applicant to show unobvious difference between the claimed product and the prior art product. *In re Marosi*, 218 USPQ 289 (Fed. Cir. 1983). The applied prior art strongly suggested the claimed subject matter. It is noted that if the applicant intends to rely on Examples in the specification or in a submitted declaration to show non-obviousness, the applicant should clearly state how the Examples of the present invention are commensurate in scope with the claims and how the Comparative Examples are commensurate in scope with the applied prior art. In the instant case, Olry et al. ('175) discloses a process for the manufacture of a fibrous

preform formed of refractory fibers includes the steps of providing a yarn essentially composed of discontinuous fibers made of a refractory material or a precursor thereof, with the discontinuous fibers being disposed parallel to one another, without twist, and the integrity of the yarn being achieved by a covering yarn made of a fugitive material, forming a fibrous preform from said yarn composed of parallel discontinuous fibers and a covering yarn, and eliminating said covering yarn to allow said discontinuous fibers to loosen within the bulk of said preform. (See Col 2, lines 30-48) Olry et al. ('175) disclose the covering yarn is made of a fugitive material which is to be understood as encompassing any material capable of being eliminated without leaving any residue, and without causing an alteration of the refractory fibers. For instance, the fugitive material can be a soluble polymer, such as PVA (polyvinyl alcohol). (See Col 2, lines 55-60) Olry et al. ('175) discloses that after weaving, the cloth is washed in a baths of water. (See Col 4, lines 5-10) Olry et al. ('175) further discloses the fibrous preform is then submitted to a thermal treatment (carbonisation) to transform the pre-oxidized PAN into carbon. A fibrous preform composed of carbon fibers is obtained. (See Col 4, lines 11-14) Covering is carried out using a known machine, for example the "Parafil" machine from the German company Spindelfabrike Suessen. (See Col 3, lines 10-13) While Olry et al. ('175) discloses all of the claim limitations as set forth above, the reference does not specifically disclose isotropic pitch carbon fibers.

Chiu et al. disclose insulation materials suited to high temperature applications, such as the insulation of furnaces, are formed from a mixture of pitch carbon fibers, such as isotropic pitch carbon fibers. (See Abstract) a method of forming a thermal insulation

material is also disclosed. (See Col 2, lines 1-7) The reinforcement material includes carbon fibers, alone or in combination with other carbonized or carbonizable materials. The fibers preferably include isotropic pitch-based carbon fibers, either alone or mixed with other carbon fibers. (See Col 2, lines 66-67 and Col 3, lines 1-3) Isotropic pitch carbon fibers have been found to exhibit a desirable combination of low thermal conductivity and high flexural strength, as compared to other carbon fibers, such as polyacrylonitrile (PAN)-based carbon fibers and mesophase pitch carbon fibers. (See Col 3, lines 6-10) The pitch is heated to a liquid state and spun to form semi-viscous solid "fibers." The fibers are stabilized by a process known as infusibilization. (See Col 3, lines 25-27) While isotropic pitch fibers are preferred, it is also contemplated that all or a portion of the carbon fibers be mesophase pitch carbon fibers or other carbonized fibers, such as those derived from rayon or PAN. (See Col 3, lines 35-39) Yarns may be woven in desired shapes. (See Col 3, lines 65-66)

As Olry et al. ('175) and Chiu et al. are directed to materials comprising carbon fibers, the art is analogous. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention motivated by expected success to utilize the isotropic pitch carbon fibers as taught by Chiu et al. in place of and/or in addition to the carbon fibers as disclosed by Olry et al. ('175) for the added benefit of a desirable combination of low thermal conductivity and high flexural strength. (See Col 3, lines 6-10) Therefore, examiner notes that an isotropic pitch-based carbon fiber spun yarn fabric having a mixture of fiber types is provided for by the method as disclosed by modified Olry et al. ('175).

Regarding claims 2 and 15 applicant discloses that it is *preferable* that the composite yarn further include a sizing agent formed on the surface of the spun yarn which will be dissolved and removed from the spun yarn fabric. (See pg. 6, lines 2-7 *emphasis added*) As such, examiner notes that because the sizing agent is to be ultimately removed, using a sizing agent would not change the final structure of the fabric there being no suggestion in the instant specification to the contrary. Additionally, as set forth above, Olry discloses a substantially similar final fabric product as that claimed by applicant. Examiner therefore has reason to believe that the fabric as disclosed by Olry et al. meets the limitations as claimed by applicant.

Regarding claims 4, 10, and 17 Olry et al. discloses the sacrificial material could be polyvinyl alcohol (PVA). (See Col 5, lines 51-60) Applicant discloses that the *preferred* water-soluble polymer fiber is a water-soluble vinylon fiber. (See pg. 8 lines 11-13, *emphasis added*) As such, examiner notes that because the water-soluble polymer fiber is to be removed, the exact nature of the fiber (i.e. vinylon) would not change the final structure of the fabric and any water-soluble polymer fiber would be sufficient there being no suggestion in the instant specification to the contrary. (See pg. 5, lines 1-6) Examiner therefore has reason to believe that the polyvinyl alcohol covering yarn as disclosed by Olry et al. meets the limitations as claimed by applicant.

8. Claims 2, 5,6, 8, 11,12,15,18-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Olry et al. (US 5,228,175) in view of Chiu et al. (US 6,800,364) as applied to claim 1 above, and further in view of Kitamura et al. (US 5,030,435) and Hattori et al. (US 4,552,329)

Regarding claims 2, 8 and 15, modified Olry et al. ('175) discloses all of the claim limitations as set forth above, but the reference does no specifically discloses that the composite yarn further comprises a sizing agent layer which is also dissolved and removed with the water-soluble polymer fiber.

Kitamura et al. discloses pitch carbon fiber chopped strand accumulation has a high bulk density and relieve exothermic excursion naturally, and therefore neither combustion nor sticking takes place even in an oxidative atmosphere. (See Abstract) Kitamura et al. discloses an appropriate sizing agent, for example, a low-boiling solvent such as water and methanol or a sizing agent containing a solid lubricant such as molybdenum disulfide, tungsten disulfide, talc or graphite, is coated to pitch fiber just after the melt spinning process, bundling the fibers with a bundling roller, and then immediately cutting the bundle with a cutting apparatus into a length of 1 to 50 mm, preferably 1 to 25 mm, to obtain a chopped strand. (See Col 2, lines 46-55) The chopped strand of high density accumulation thus obtained is subsequently infusibilized and carbonized. (See Col 2, lines 64-66) Kitamura et al. discloses that the pitch fiber bundle may be isotropic. (See Col 3, lines 9-10)

Hattori et al. discloses carbon fibers made from polyacrylonitrile and pitches comprising a sizing agent. (See Col 4, lines 20-21) Hattori et al. further discloses one such method of separating bundles of carbon fibers into single fibers is a method in which sizing agent applied onto the surfaces of a single fiber for the purpose of facilitating handling of the fibers, is removed, followed by dispersing them in water with supersonic agitation. (See Col 5, lines 1-5) An alternative method of separating bundles

of carbon fibers into single fibers is a method of using the carbon fibers treated with a water-soluble sizing agent. (See Col 5, lines 35-37)

As modified Olry et al. ('175), Kitamura et al., and Hattori et al. are all directed to pitch carbon fiber bundles, the art is analogous. Therefore it would have been obvious to one of ordinary skill in the art the time of the invention motivated by expected success to utilize the sizing agent as taught by Kitamura et al. and specifically, the water-soluble sizing agent of Hattori et al. in the fiber bundle as disclosed by Olry ('175) for the added benefit of facilitate handling of the fibers. (See Hattori et al. Col 5, lines 1-5)

Regarding claims 5, 6, 11, 12, 18, 19, 20-23 modified Olry et al. ('175) disclose the fibers having an average length of between 100 and 120mm (about 4 to 5 inches) can be obtained. (See Col 3, lines 1-3) Kitamura et al. discloses that the fibers may be cut to a length of 1 to 50mm, preferably 1 to 25mm. (See Col 2, lines 53-55) Kitamura et al. also discloses it is difficult to cut the bundle into a length shorter than 1 mm, and such a fiber length is too short to embody the desired reinforcing effect. When the length of the chopped strand is longer than 50 mm, the chopped strand is the same to a continuous fiber so that an increase in fiber length gives no increase in reinforcing effect. When the length of the chopped strand is more than 50 mm, the high density accumulation state cannot be attained, and infusibilization is thereby hindered. (See Col 2, lines 56-64) It would have been obvious to one of ordinary skill in the art at the time of invention to have selected the overlapping portion of the ranges disclosed by the reference because overlapping ranges have been held to be a prima facie case of obviousness. *In re Malagari,* 182 USPQ 549. Further, modified Olry et al. ('175) fails to teach the isotropic

spun yarn contains fine carbon fiber aggregates having a maximum diameter equal to or below 3.0 times an average diameter of foundation yarn of the spun or an abundance ratio equal to or below 3 pieces per 10m . It would have been obvious to one of ordinary skill in the art at the time the invention was made to optimize the diameter and abundance ratio since it has been held that, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation. *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). The burden is upon the Applicant to demonstrate that the claimed diameter and abundance ratio are critical and has unexpected results. In the present invention, one would have been motivated to optimize the diameter and abundance ratio motivated by the desire to control the strength and insulation properties to make them suited to use as replaceable insulation since Chiu et al. discloses the isotropic pitch fibers or other fibers are preferably comminuted to an average length of about 100 to 1600 microns. (See Col 3, lines 47-49) Chui et al. also discloses that the term "fibers" is intended to encompass all elongate carbon-containing reinforcement materials having a length which is at least twenty times more preferably at least 100 times the fiber diameter. (See Col 3, lines 54-57) Finally, Chui et al. discloses that commercially available isotropic pitch fibers are also usable. (See Col 4, lines 3-10) Therefore, examiner has reason to believe that it would have been well within the ordinary skill of one in the art at the time of the invention to optimize the diameter and abundance ratio of the composite yarn as necessary for fabric intended use.

9. Claims 3, 9, and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Olry et al. (US 5,228,175) in view of Chiu et al. (US 6,800,364) as applied to claim 1 above, and further n view of Bompard et al. (US 6,585,842)

Regarding claims 3, 9, and 16 modified Olry et al. ('175) disclose the yarn is useful for fabricating fiber preforms for composite material parts. (See Col 1, lines 8-12) A fiber preform for a composite material part is produced by forming a two-dimensional fiber fabric at least partially from a hybrid yarn, by superposing plies formed by the fiber fabric and, after eliminating the covering yarn, by needling the superposed plies. (See Example 1) modified Olry et al. ('175) discloses all of the claim limitations as set forth above, but the referenced doesn't specifically discloses that the water-soluble polymer fiber comprises a first water-soluble polymer fiber would in a first direction and a second water-soluble polymer fiber wound in a second direction.

Bompard et al. discloses a plurality of unidirectional sheets composed of two of various kinds depending on the use intended for the sheet. (See Abstract and Col 8, lines 15-16) Bompard et al. further discloses the tows may be of carbon fibers or ceramic fibers, or of fibers that are precursors of carbon or ceramic, glass fibers, aramid fibers, or a mixture of different kinds of fiber. (See Col 8, lines 16-19) The tows can be made of continuous filaments or of discontinuous filaments, and if they are discontinuous they can be obtained, for example, by bursting tows of continuous filaments. With tows made of discontinuous filaments, it is possible to use hybrid tows comprising filaments of different materials that are intimately mixed together. (See Col 8, lines 21-27) The strip 20a is placed adjacent to other strips 20b, 20c, 20d, and 20e that are identical or similar

on a roll 25 that is free to rotate, thereby forming a unidirectional sheet 30. The strips can thus come from tows that are identical or different, e.g. if different, from tows of different weights, or made of fibers of different kinds, thereby making it possible to obtain a hybrid sheet. (See Col 8, lines 64-67) Various polymers can be used. Advantageously, the polymers used can be suitable for being sacrificed, i.e. they should be easy to eliminate, e.g. by being dissolved or by applying heat treatment. Amongst such polymers, mention can be made of polyvinyl alcohol (PVA) or polyvinylpyrrolydone type polymers that are soluble in water, and of soluble polyester. (See Col 9, lines 28-34) The resulting multiaxial sheets can be used for making the reinforcement of composite material parts, e.g. by well-known techniques of draping or needling superposed plies. (See Col 18, lines 17-19)

As modified Olry et al. ('175) and Bompard et al. are both directed to fibers for use in composite material parts, the art is analogous. Examiner notes that Bompard et al. teaches two different water-soluble polymers to be used with the carbon fibers. Therefore, since modified Olry et al. ('175) discloses the use of a water-soluble fiber from a polyvinyl alcohol polymer also recognized by the teaching of Bompard et al., it would have been obvious to one of ordinary skill at the time of the invention to utilize polymer fibers made from both types of polymers instead of just one in order to provide a completely expected result of a polymer fiber that would be dissolved from the composite yarn fabric. Absent unexpected results, examiner also notes that since both fiber types surrounding the isotropic pitch-based carbon fiber spun yarn are to be dissolved and

removed, it would not matter which direction the fibers were wound as their function would be completely temporary for achieving the final product.

10. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

***Conclusion***

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to ALTREV C. SYKES whose telephone number is (571)270-3162. The examiner can normally be reached on Monday-Thursday, 8AM-5PM EST, alt Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Larry Tarazano can be reached on 571-272-1515. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/D. Lawrence Tarazano/
Supervisory Patent Examiner, Art Unit 1794

/ACS
Examiner
4/28/09